

## Patent Claims

### Opalescent Glass Ceramic

1. An opalescent glass ceramic, in particular an opalescent glass ceramic as a dental material or as an additive to or component of dental material, comprising at least the components  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{P}_2\text{O}_5$ ,  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{CaO}$  and  $\text{Me(IV)O}_2$ , characterized in that the opalescent ceramic is devoid of  $\text{ZrO}_2$  and  $\text{TiO}_2$ , that the glass ceramic has a  $\text{Me(II)O}$  content of less than 4% by weight and that the  $\text{Me(IV)O}_2$  content is 0.5 to 3% by weight.
2. The opalescent glass ceramic according to claim 1, characterized in that  $\text{Me(IV)O}_2$  is composed of 0 - 1% by weight  $\text{CeO}_2$  and 0 - 2.5% by weight  $\text{SnO}_2$ .
3. The opalescent glass ceramic according to claim 1, characterized in that the  $\text{Me(II)O}$  content is 2 - 3.5% by weight, in particular 2.5 - 3% by weight.
4. The opalescent glass ceramic according to any one of the claims 1 to 3, characterized in that the glass ceramic contains the following components:

Component	% by weight
$\text{SiO}_2$	55 - 62
$\text{Al}_2\text{O}_3$	13 - 17
$\text{B}_2\text{O}_3$	0 - 2
$\text{P}_2\text{O}_5$	1.5 - 3
$\text{Li}_2\text{O}$	0 - 2
$\text{Na}_2\text{O}$	7 - 12
$\text{K}_2\text{O}$	8 - 12
$\text{MgO}$	0 - 2
$\text{CaO}$	1 - 4
$\text{BaO}$	0 - 2
$\text{Tb}_2\text{O}_3$	0 - 3
$\text{Me(IV)O}_2$	0.5 - 3

the indicated amount of  $\text{Me(IV)O}_2$  being composed of 0 - 1% by weight  $\text{CeO}_2$  and 0 - 2.5% by weight  $\text{SnO}_2$ .

5. The opalescent glass ceramic according to any one of the claims 1 to 3, characterized in that the glass ceramic contains the following components:

Component	% by weight
$\text{SiO}_2$	58 - 60
$\text{Al}_2\text{O}_3$	14 - 15
$\text{P}_2\text{O}_5$	2.3 - 2.6
$\text{Na}_2\text{O}$	9.5 - 10.5
$\text{K}_2\text{O}$	9 - 10
$\text{CaO}$	2.8 - 3.0
$\text{SnO}_2$	1.3 - 1.6
$\text{CeO}_2$	0.3 - 0.4
$\text{Tb}_2\text{O}_3$	0 - 2.0

6. The opalescent glass ceramic according to at least one of the preceding claims, characterized in that  $\text{CeO}_2$  and/or  $\text{Tb}_2\text{O}_3$  are fused to obtain a fluorescent property.
7. The opalescent glass ceramic according to at least one of the preceding claims, characterized in that the glass ceramic has a thermal expansion coefficient (TEC) in the range of  $9.0 - 13.5 \times 10^{-6}/\text{K}$ , in particular  $10.5 - 12.0 \times 10^{-6}/\text{K}$ .
8. A method for producing an opalescent glass ceramic according to any one of the claims 1 to 7, in particular an opalescent glass ceramic as a dental material or as an additive to or component of dental material, comprising at least the components  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{P}_2\text{O}_5$ ,  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{CaO}$  and  $\text{Me(IV)O}_2$ , characterized in that the method comprises the

following procedural steps:

- weighing in and mixing the components with a mixing ratio according to one of the claims 1 to 6;
- melting the mixture in a furnace;
- quenching the molten mass coming out of the furnace in a water bath and subsequent drying;
- grinding the frit thus obtained in a mill;
- tempering the frit;
- after drying, filling the frit in a mill and grinding the frit;
- sifting the ground frit through a sieve, the sieve opening forming the end.

9. The method according to claim 8, characterized in that the tempering of the frit is carried out in the following manner:

- stacking the ground frits on quartz-coated fire-clay plates,
- placing the fire-proof plates in a furnace, e.g. an electric furnace, heated to a temperature  $T$  with  $850^{\circ}\text{C} \leq T \leq 1000^{\circ}\text{C}$ ,
- removing the plates from the furnace after a time  $t$  with  $30 \text{ min} \leq t \leq 60$ ,
- quenching the melted frit cakes in a water bath.

10. The method according to claim 8 or 9, characterized in that the components are mixed in a gyro mixer.

11. The method according to at least one of the claims 8 to 10, characterized in that the mixture is melted in a preferably gas-heated drip-feed crucible furnace.

12. The method according to at least one of the claims 8 to 11, characterized in that after drying, the frit is filled into a ball mill and ground with about 10,000 revolutions per minute.

13. The method according to at least one of the claims 8 to 12,

characterized in that the ground frit is preferably sifted through a sieve having a mesh size M in the range of  $80 \mu\text{m} \leq M \leq 120 \mu\text{m}$ , preferably  $M = 100 \mu\text{m}$ .

14. The method according to at least one of the claims 8 to 13, characterized in that the fusing is produced by heating the granulated material to 870 to 970°C.
15. The method according to at least one of the claims 8 to 14, characterized in that the thermal expansion coefficient (TEC) is set to a value  $9.0 \leq \text{TEC} \leq 13.5 \times 10^{-6}/\text{K}$  by the  $\text{K}_2\text{O}$  content.
16. The method according to at least one of the claims 8 to 15, characterized in that the baking temperature of the opalescent glass ceramic is controlled by the proportions of  $\text{B}_2\text{O}_3$ ,  $\text{Li}_2\text{O}$  and  $\text{Na}_2\text{O}$  and is preferably in the range of 870°C to 970°C.
17. Use of the opalescent glass ceramic according to at least one of the preceding claims as a dental material or as an additive to or component of dental material.
18. The use according to claim 17, wherein the opalescent glass is a component of inlays, onlays, bridges or crowns.